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SPECIFICATIONS

TIN-CLAD FIRE DOORS
AND
SHUTTERS

1914

INSPECTION DEPARTMENT
Associated Factory
Mutual Fire Insurance Companies
31 New Street, Boston, Mass.

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INSPECTION DEPARTMENT
OF THE
Associated Factory
Mutual Fire Insurance Companies,
31 MILK STREET, BOSTON.

May 1, 1914.

SPECIFICATIONS
FOR
TIN-CLAD FIRE DOORS.

Two types of tin-clad fire doors are covered by these specifications: —

Type No. 1 or Standard Door. This has a three-ply wooden core and double lock joints in the tin covering.

Type No. 2. This has a two-ply wooden core and double lock joints in the tin covering.

The correct door for a given location is covered broadly by the following table: —

<i>1st Class Fire Walls</i> between two buildings or large sections of the same building.	Type No. 1 door each side of wall.
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<i>2nd Class Fire Walls</i> between important rooms or enclosing some special hazard.	Type No. 1 door one side of wall.
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<i>3d Class Fire Walls.</i> Minor division walls and partitions, stair and elevator wells, belt towers, etc.	Type No. 2 door one side of wall.
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For openings in elevator wells, in addition to the doors of the horizontal sliding and swinging types a special type of

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door may be used, designed with a horizontal joint at the center, the upper half sliding upward and being counterbalanced by the lower half, which slides downward. When these are built according to the specifications for the Type No. 2 door and are securely supported by guides bolted to the wall, they are an acceptable substitute for the regular designs. These doors are light enough to be operated by the elevator or by hand and usually are kept closed, but they should be provided with an automatic heat closing device unless so arranged as to be automatically closed by the operation of the elevator.

TIN-CLAD FIRE DOORS.

1. DOOR OPENINGS.

(a) Door openings should be as few and as small as the nature of the occupancy will permit, and preferably should not exceed 80 square feet in area.

(b) At every door opening in a 1st class fire wall, fireproof sills and heads must be provided.

(c) At door openings in 2d and 3d class fire walls fireproof sills are generally not required, but the head of the opening must be fireproof.

2. SILLS.

Several satisfactory methods of constructing fireproof sills are employed, two of the best of which are as follows: —

A wrought iron or steel plate checkered on top, at least $\frac{1}{4}$ " thick, built into wall at each end, and extending from outside to outside of doors, is bedded upon 6 inches to 8 inches of concrete laid in as wide a strip as possible. (See Fig. 2.) Sills raised about 2 inches above the floor and having a brow each side are recommended to prevent water from running through doorways.

A somewhat more substantial sill of cast iron, checkered on top is shown in Fig. 1. This should be long enough to extend 4" into wall at each side of door opening.

3. HEADS.

The heads of the openings should be either brick arches or suitably protected I-beams. Stone or tin-clad wooden lintels should not be used.

4. LAP OF DOORS.

(a) Sliding doors when shut must overlap the sides and top of the opening four inches, and should have the top built on a pitch of $\frac{3}{4}$ -inch per foot, when designed to close by gravity.

(b) Swinging doors should preferably shut into a 4" brick rabbet, or into an iron door frame anchored to the wall. If closing onto the face of the wall, doors should lap the opening four inches all around.

5. CORES.

Cores must be constructed of white pine, cypress or other soft wood. Stock must be *dry and thoroughly seasoned*, sound and free from sap or loose knots.

From time to time, fire doors have proved defective after a few years in service due to dry rotting of the cores. In one plant alone about forty doors had to be replaced due to this defect.

The subject of dry rot has been thoroughly investigated by the Inspection Department and the findings have recently been published in a pamphlet entitled "Dry Rot in Factory Timbers." As a result of this investigation it is believed that practically all fungi usually found in fire door stock will be killed by heating. It is therefore recommended that the completed door be placed in a dry kiln at 225° F. for twenty-four hours.

This is preferable to relying upon kiln-drying the stock before building the cores, because the boards are liable to infection from handling and by coming in contact with other boards before use.

Another efficient method is to chemically treat the lumber, but this is more expensive and also is liable to injure the tin covering.

Boards must be tongued and grooved, dressed both sides to $\frac{13}{16}$ ", not beaded, and not over 8" wide.

The lengths of boards must be such that not more than two pieces are used in any continuous strip on either exposed face, and at least alternate strips must be full length boards. Shorter lengths may be used in the middle section of three-

ply cores, but in no case shall there be more than three pieces in any of such middle layers.

Three-ply doors must have the outer layers vertical and the inner layer horizontal and two-ply doors must have one layer vertical and one horizontal. (See Fig. 3.) The layers must be thoroughly fastened together by wrought iron clinch nails not over 8" apart, extending clear through the door and clinched on the back side, leaving both surfaces of the door smooth. (See Fig. 4.) The edges and corners of the doors must be true and square.

6. COVERING.

The object of covering the wooden core with tin is to exclude the air and prevent combustion. For this reason the covering must lie flatly against the core and the joints must be made mechanically strong. To secure these results the following specifications must be carefully followed.

(a) *Plates.* The covering for doors and shutters, whether exposed to dampness or not, should be Terne Plate. Plates should be of Basic Open Hearth steel 14" x 20" and of "I. C." thickness, weighing at least 103 lbs. net per box of 112 sheets, exclusive of the coating. This should weigh 10 lbs. per box additional, and should be an alloy of not less than 25 per cent tin and not more than 75 per cent lead.

(b) *Method of Covering.* The corners of the door should be covered first, using a whole sheet of tin without cutting and with a mitre fold nailed under the fold. (See Figs. 5, 6 and 7.)

The edges should next be covered with either regular plates or long sheets. (See Fig. 14.)

The faces of the door should then be covered beginning at the lower right-hand corner. (See Figs. 15 and 16.)

The top horizontal joint and all vertical ones must be double lock joints of a type shown in Figs. 10 to 13, inclusive, and the remaining ones should be single lock. (See Figs. 8 and 9.) The finished lap in all cases must be full $\frac{1}{2}$ ".

All joints, including the folds at the corners, must be made to shed water. The plates should be fastened to the core with 2" wire nails barbed full length, five nails being used on the

sides, and four on the ends of each sheet, and driven close to the center of each joint. Finished seams must be well flattened, no nail heads must be exposed and no solder must be used.

When covering is complete cut a hole three inches in diameter through the middle plate on the *exposed* side of the door but *not through* the wood core. Secure the tin around this opening with small nails and thoroughly paint the wood thus exposed. (See Fig. 17.)

The hole will prevent bulging of the covering and rupture of the joints by permitting the escape of gases generated from the wood core when the door is exposed to fire.

Finish doors having double lock joints in the tin covering are shown in Figs. 17, 23 and 25.

HARDWARE

7. FOR SLIDING DOORS.

(a) *Track.* The track for sliding doors must be made of $3\frac{1}{2}'' \times \frac{3}{8}''$ flat rolled steel preferably with rounded edges. To make allowance for the lap of the door and for attaching the bumpers, the length of track must be made equal to twice the width of the door *opening*, plus 21 inches. The track, when mounted, must have an incline of $\frac{3}{4}''$ per foot and must be bolted to the wall at least every $2\frac{1}{2}$ feet by $\frac{3}{4}''$ bolts, extending clear through the wall, and having a nut and large heavy washer at least 4'' in diameter on the opposite side. One bolt must come under each hanger when the door is closed.

To mount the track, place the door in the closed position, with the edges plumb, and with $\frac{3}{8}''$ shims under the bottom. Lay track on $\frac{1}{4}''$ shims on the top of door so that front bumper comes against front edge of door and carefully mark circles on wall at the bolt holes. Mark long crosses through the center of the circles to maintain them while drilling, and carefully drill the holes. Bolt track in position with a bracket at each bolt. The use of expansion bolts for mounting hardware is not approved.

(b) *Brackets.* The brackets between the track and the wall should be of cast iron, $1\frac{3}{4}''$ long, and must have a diameter of at least $1\frac{3}{4}''$ at the track and $3\frac{1}{2}''$ at the wall. The thickness

must not be less than $\frac{5}{16}$ " and the ring bearing against the wall must be not less than $\frac{5}{8}$ " wide.

(c) *Bumpers.* A bumper must be provided on each end of the track, securely bolted in position and opposing the edge of the door in an area of at least 7 sq. in. to avoid injury to the tin covering. The front bumper must be so located as to take the entire shock of the door when it closes, and the rear bumper must be so placed that when the door is wide open the front edge is at least one inch back from the jamb.

(d) *Hangers.* (See Fig. 22.) The hanger frame must be made of $3\frac{1}{2}$ " x $\frac{3}{8}$ " flat rolled steel, at least 21" long overall, with the upper end bent over to form a support for each end of the wheel axle. Pendant must have three holes for half-inch carriage bolts, staggered vertically, for attaching the hangers to the door. Bolts with countersunk heads on the wall side are recommended, allowing a closer fit to the wall. Hanger wheel must be at least 4" in diameter at the bottom of the groove, which must be finished and flared slightly. Wheel must be of steel, wrought iron or malleable cast iron, and if of malleable iron, should be provided with a small lug which can be bent down to test the malleability. It is suggested that this be placed on the outside in such a position that it has to be bent before the wheel can turn. Wheel hubs must be finished at the ends and must be not more than $\frac{1}{8}$ " shorter than inside of hanger frame. Wheel must be provided with a bearing of hardened steel rollers $1\frac{7}{8}$ " long, finished at the ends, turning on a $\frac{1}{2}$ " steel axle perpendicular to the hanger pendant and riveted both ends to the hanger frame. An attached hanger is shown in Fig. 1. Three hangers are generally needed for doors over six feet wide.

(e) *Bumper Shoes.* These must be made of at least No. 14 U. S. gage steel, and large enough to protect the edges and faces of the door at the points of contact with the bumpers and binders. They must be securely fastened to the door with wood screws. When the front edge of the door is liable to injury from trucks, etc., a continuous U-shaped shoe of at least No. 14 gage steel should be substituted for the usual lower bumper shoe and should extend from the bottom of the door to a height sufficient to prevent injury to the tin covering.

(f) *Chafing Strips.* $\frac{3}{4}$ " x $\frac{1}{4}$ " half oval steel chafing strips

with chamfered ends and extending to within 4" of each edge of the door must be provided to protect the tin covering from wear against the wall. They must be located about one-fourth the distance both from the top and bottom of the door on the wall side, and must be securely fastened through the door by stove bolts not over 9" apart to 1" x $\frac{1}{8}$ " strips on front of door to resist bulging of the tin covering.

(g) *Wedge*. This should be of cast iron $4\frac{1}{2}$ " long, $1\frac{1}{2}$ " wide and $\frac{3}{4}$ " thick at base, located behind stay roller when door is closed, and securely fastened to door by two countersunk wood screws.

(h) *Handles*. The bow handle for the front of the door must be of cast iron (preferably malleable) or of steel, of large heavy design and with a hand opening of at least $4\frac{1}{2}$ " x $1\frac{3}{4}$ ". The area bearing against door must be at least two square inches at each end to avoid injury to the tin covering.

The flush pull for the back of the door must be of cast iron (preferably malleable), or of steel, with finger opening at least $4\frac{1}{2}$ " long, $1\frac{3}{8}$ " wide and $1\frac{1}{2}$ " deep. It must have holes at each end, by which it is bolted through the door by $\frac{1}{4}$ " bolts to the bow handle and must also have a countersunk hole in the center of each side for wood screws.

(i) *Binders*. A binder must be provided about one-quarter of the distance from the top and 18" from the bottom of the front edge of the door, to hold it against the wall when the door is closed. The binders must be made of $3\frac{1}{2}$ " x $\frac{3}{8}$ " flat rolled steel about 13" long overall, having the end receiving the door offset from the wall 3" and lapping the door 4" and with the end curved outward slightly to freely admit the door. Each binder must be attached to the wall by two $\frac{3}{4}$ " bolts $6\frac{1}{2}$ " apart, extending clear through the wall, and provided with nut and large washer on the opposite side. The binders must be set so that they do not receive the shock of the door when it closes, as the bumpers are provided for this purpose.

(j) *Stay Roll Guide*. The frame of the stay roll guide must be of $2\frac{1}{2}$ " x $\frac{1}{2}$ " flat rolled steel, made U-shaped with the leg against the wall at least 11" high, and with the center of the roller $7\frac{1}{2}$ " above the sill. Distance from face of wall to inside of outer leg when in position must be $3\frac{3}{8}$ ". Guide may

be attached to wall by two $\frac{3}{4}$ " bolts, or by one bolt if upper end of leg against wall is turned one inch into wall to prevent twisting. Guide must be let into wall so that bolt heads will be flush and the bolts should be 6" from the jamb of the door opening where they will not work loose. In this case either an offset piece or a skew leg will be necessary to bring roller in contact with wedge when the door is in the closed position. (See Figs. 19 and 20.)

Roller must be of cast or malleable iron, at least $3\frac{1}{2}$ " in diameter, and 1" wide on the face, which should be slightly rounded. Roller must be mounted on a $\frac{1}{2}$ " bolt provided with a pipe bushing to prevent binding or on a shouldered $\frac{3}{4}$ " bolt if preferred, and $\frac{3}{4}$ " effective adjustment must be provided. When the door is closed, the roller must bear against the wedge and hold the door close to but not tightly against the wall. A $1\frac{1}{2}$ " x $\frac{1}{8}$ " flat strip the full width of door to take the wear of the stay roller must be securely fastened to the front of the door parallel to track by countersunk wood screws not over 12" apart.

(k) *Releasing Device.* Each door must be counterbalanced by a weight sufficient to keep it in any open position. For the sliding door weight should be suspended by a braided sash cord passing over a pulley attached to the rear bumper and fastened by a fusible link to the link arm on the front edge of the door about 18" from the top so that in any open position of the door the link will be located beyond the edge of the door and in front of the door opening. (See Fig. 17). For the swinging door the closing device should be so arranged that the fusible link will be located in the top of the door opening. (See Fig. 23.)

The counterweight pulley must be of cast or malleable iron at least four inches in diameter at the bottom of the groove, which should be rounded at the bottom and not less than $\frac{1}{2}$ " deep. It must be mounted on a $\frac{3}{4}$ " bolt provided with a pipe bushing to prevent binding or on a shouldered $\frac{3}{4}$ " bolt if preferred.

The link must be made of materials not readily susceptible to corrosion and must be as sensitive to heat as possible consistent with strength. The link must be able to sustain indefi-

nately a load of at least three times that to which it is subjected in practice. When located in rooms of ordinary temperature, the link must operate between 155° and 165° F. under a tension of two pounds. In case higher degree links are needed, they should operate at about 212° , 286° or 360° F., respectfully.

All links must be stamped with the name or trade mark of the manufacturer, the year when made and with the fusing point of the solder.

The link arm must be of malleable or wrought iron of such design that it will not be in contact with the link nor interfere with its free operation. It must be securely fastened to the door with countersunk wood screws. A completed door is shown in Fig. 17.

8. FOR SWINGING DOORS.

Various satisfactory patterns of swinging door hardware are being used, and the following outline represents average present practice. Strict adherence to the dimensions given is not necessary, provided the door is hung in a substantial manner.

(a) *Wall Eyes.* Each wall eye should be of wrought iron or steel designed for $\frac{3}{4}$ " pin and built in wall or fastened to it by a $\frac{3}{4}$ " through-bolt with a washer each side. They should be located far enough from the edge of the opening to prevent weight of door loosening the masonry. (See Fig. 21.)

(b) *Hinges.* Hinges should be of wrought iron or steel $2\frac{1}{4}$ " x $\frac{3}{8}$ ", extending at least one-half of the width of the door and fastened to it by $\frac{3}{8}$ " carriage bolts not over 9" apart. Doors over seven feet high or six feet wide should have three hinges. (See Fig. 21.)

(c) *Latch.* The latch should be of $1\frac{1}{2}$ " x $\frac{3}{8}$ " steel swinging freely on a $\frac{3}{8}$ " bolt extending through the door. (See Fig. 24.) To prevent chafing the tin covering, a washer should be placed beneath the latch at the bolt and a plate beneath it at the tumbler. Handles must be provided to operate latch from either side of door. Doors over seven feet high or six feet wide should have two latches, spaced about one-third the distance from the top and bottom of the door, and arranged to work together by the operation of one handle.

(d) *Keepers*. For single doors the keepers must be built in the wall or bolted through it. For double doors in pairs, the standing door must be bolted at top and bottom by $\frac{1}{8}$ " steel bolts, held securely in position by $\frac{3}{8}$ " bolts through the door and entering substantial strikes securely fastened into arch and sill. They may be operated independently or together. The keepers for the live door must be securely fastened to the standing door by through-bolts.

All keepers must be designed so as to permit the latches to freely enter.

(e) *Center Joint*. Where doors are in pairs, either swinging or sliding, the center joint may be either rabbeted or made with about $\frac{1}{8}$ " clearance and covered with a $\frac{1}{4}$ " x 3" astragal attached to the edge of the live door by through-bolts. Fig. 25 shows a joint with a rabbet and Fig. 26 illustrates an astragal.

(f) *Closing Device*. The closing device must be such that the door will close automatically from any open position by the fusing of a link. (See Fig. 23.) If attached to a pair of doors, the standing door must automatically close first.

9. CARE AND MAINTENANCE.

Fire doors should be kept normally closed and must at all times be maintained unobstructed and in good operative condition. If the sliding doors should sag and chafe on the sill, pieces of $\frac{3}{4}$ " gas pipe around the track bolts will often remedy the trouble, but bearing plates for the bolts may at times be necessary.

When there is danger of piling stock against sliding fire doors, a substantial guard should be provided to prevent obstruction of the door. Fig. 18 shows a good arrangement using planks securely fastened in place.

Fire doors should preferably not be painted unless it is necessary to prevent rusting, in which case a priming coat of red lead and linseed oil is recommended, to be followed by any good inside paint of desired color.

TIN-CLAD FIRE SHUTTERS.

10. CONSTRUCTION.

Construction to be the same as for No. 2 Type fire doors.

11. SIZE AND TYPE.

Shutters may either overlap or fit close inside the window opening. Single swinging shutters furnish the best protection, although those made in pairs may be used on large openings.

Sliding shutters are not recommended because accumulation of snow and ice on the track and sill may prevent closing in spite of shields arranged as a protection.

12. JOINT.

When shutters are in pairs, the center joint may be either rabbeted or made with about $\frac{1}{8}$ " clearance and covered with a $\frac{1}{4}$ " x $2\frac{3}{4}$ " astragal bolted to one shutter by carriage bolts. (See Fig. 26.)

The center joint must not be made with a tight fit because of the liability of binding.

13. HINGES.

Hinges should be of $\frac{5}{8}$ " x $1\frac{3}{4}$ " steel secured by carriage bolts passing through the shutter.

The hinge pin or eye must be designed for $\frac{1}{2}$ " pin and securely built in or set into the wall. (See Fig. 21.) The use of expansion bolts is not approved.

14. LATCHES.

Latches should be $1\frac{1}{2}$ " x $\frac{3}{8}$ " steel pivoted on $\frac{3}{8}$ " carriage bolts passing through shutter. Two latches should generally be used, spaced about one-third the distance from the top and bottom and should be connected by a bar so arranged as to operate both latches together from either the outside or inside.

The keepers for single shutters must be securely built in or set into the wall, and for double shutters must be bolted through one shutter at least six inches from the edge.

Gang control for shutters to be operated from either inside or outside of building is shown in Fig. 27.

15. PAINTING.

As a protection against the weather, the shutters should be given a priming coat of red lead and linseed oil, followed by a coat of any good outside paint.

GUARANTEE REQUIRED OF LISTED MANUFACTURERS.

Fire doors and hardware made by any reliable manufacturer will be examined for approval free of charge and if the examined door is satisfactory, the name of the manufacturer will be placed upon the approved list published by the Associated Factory Mutual Fire Insurance Companies, provided he will make the following guarantee: —

1. That all fire doors and hardware made and sold by him as filling the requirements of the Associated Factory Mutual Fire Insurance Companies, will conform to these specifications, and be like approved samples.

2. That no changes in material or construction will be made until written notice has been given, and the changes have been approved.

3. That any fire doors or hardware purchased under these specifications and not conforming to them or any doors which develop dry rot or other structural weakness, due to defects of manufacture, shall be replaced without expense to the owners.

ILLUSTRATIONS.

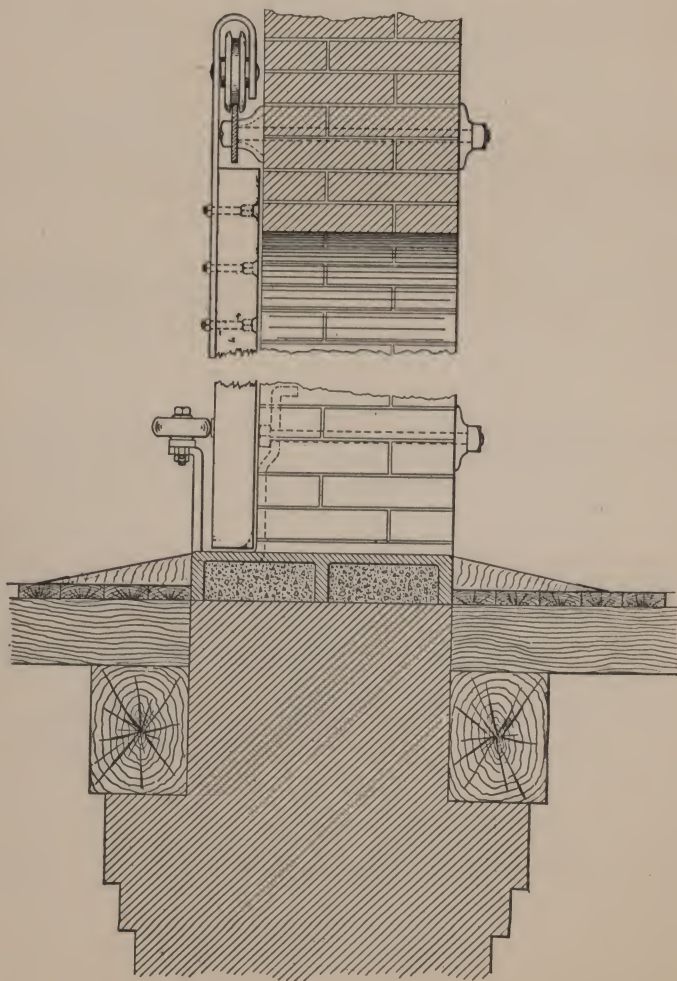


Fig. 1.
SECTION THROUGH DOORWAY.

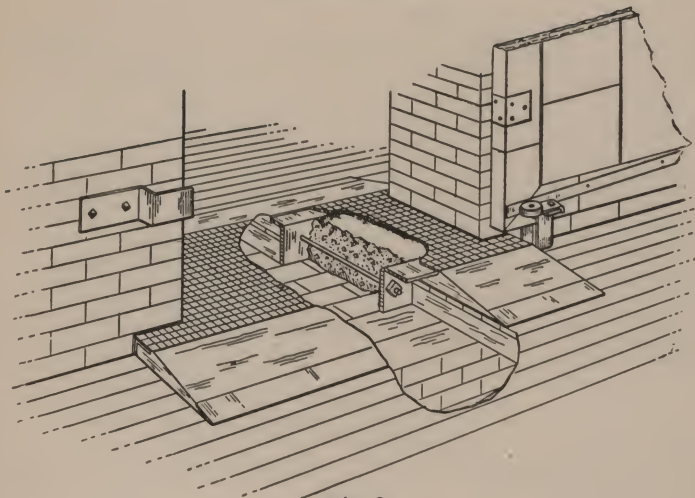


Fig. 2.
CONCRETE SILL WITH CHECKERED PLATE.

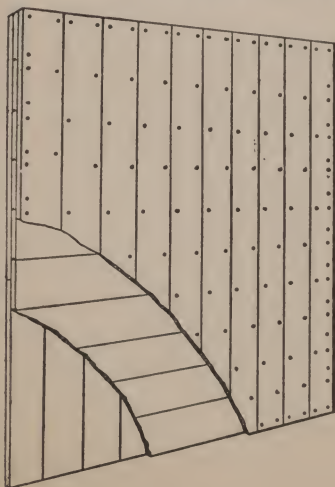


Fig. 3.
METHOD OF CONSTRUCTING CORE.

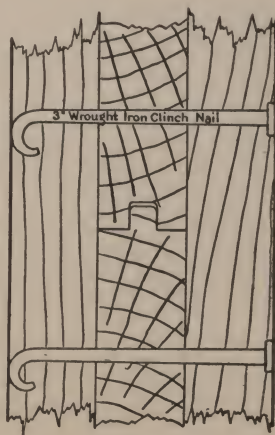


Fig. 4.
CLINCH NAILING.

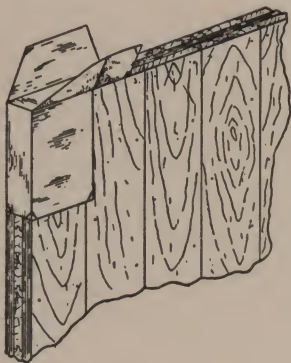


Fig. 5.

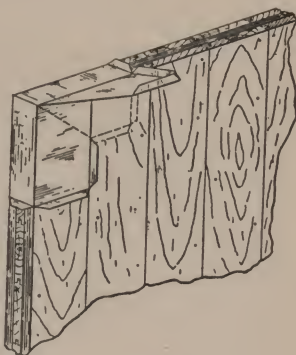


Fig. 6.

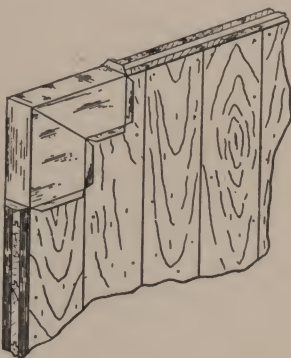


Fig. 7.



Fig. 8.



Fig. 9.

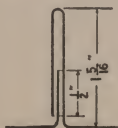


Fig. 10.

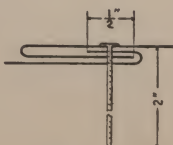


Fig. 11.



Fig. 12.

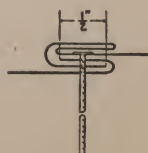


Fig. 13.

MITRE FOLD FOR CORNERS.
SINGLE AND DOUBLE LOCK JOINTS.

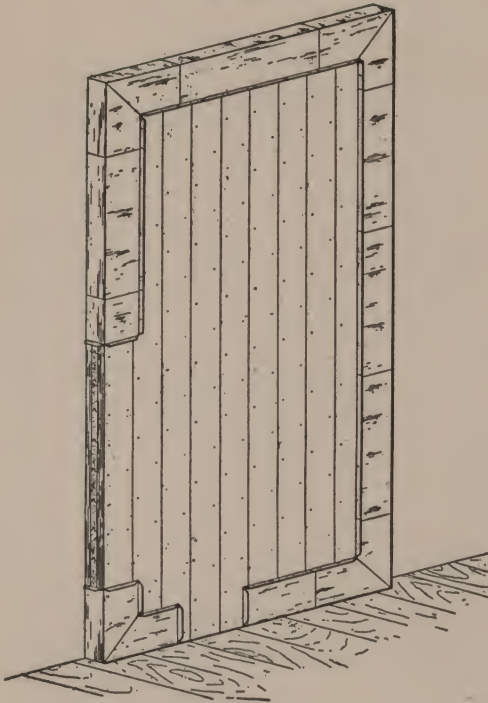


Fig. 14.
METHOD OF COVERING EDGES.

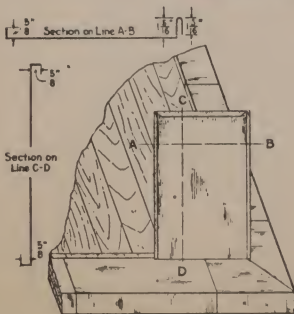


Fig. 15.
APPLYING FIRST SHEET ON FACE OF DOOR.

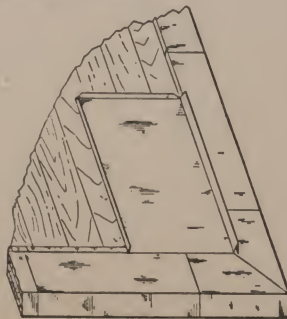


Fig. 16.

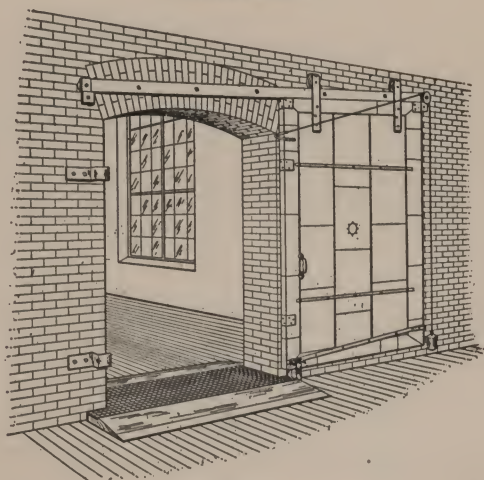


Fig. 17.
COMPLETED DOOR PROPERLY HUNG.

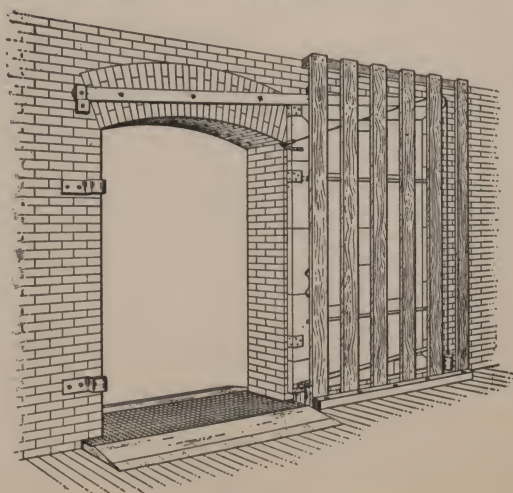


Fig. 18.
SLATTED GUARD FOR SLIDING DOORS.

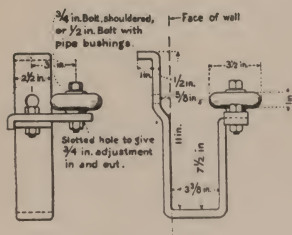


Fig. 19.
STAY ROLL WITH OFFSET.

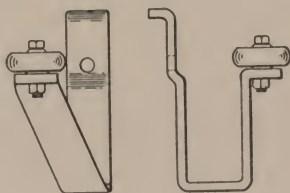
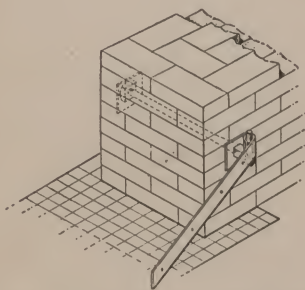


Fig. 20.
STAY ROLL WITH SKEW LEG.



	Wall Bolt	Hinge Pin	Hinge
Doors	$\frac{3}{4}$ "	$\frac{3}{4}$ "	$2\frac{1}{2}$ " x $\frac{3}{8}$ "
Shutters	$\frac{5}{8}$ "	$\frac{1}{2}$ "	$1\frac{3}{4}$ " x $\frac{5}{16}$ "

Fig. 21.
DOOR AND SHUTTER HINGE.



Fig. 22
SECTION OF HANGER

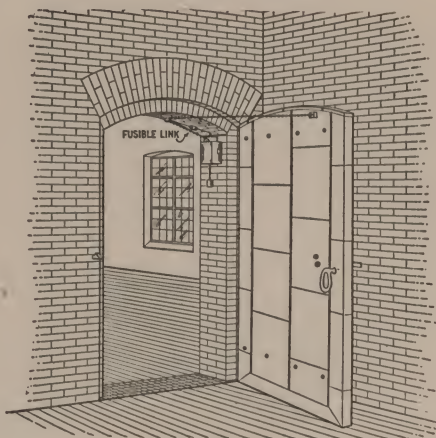


Fig. 23.
SWINGING TIN-CLAD DOOR.
WITH AUTOMATIC CLOSING DEVICE.

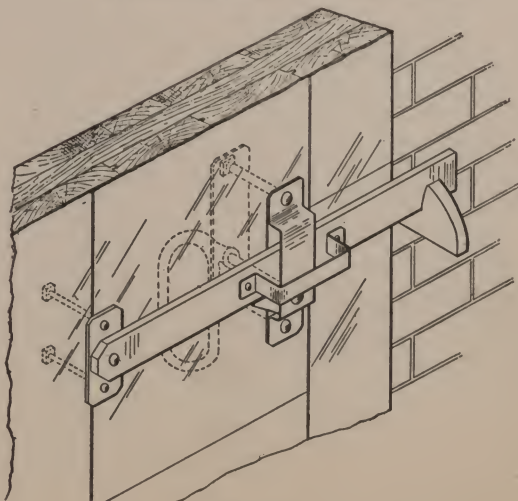


Fig. 24.
LATCH FOR SWINGING DOORS.

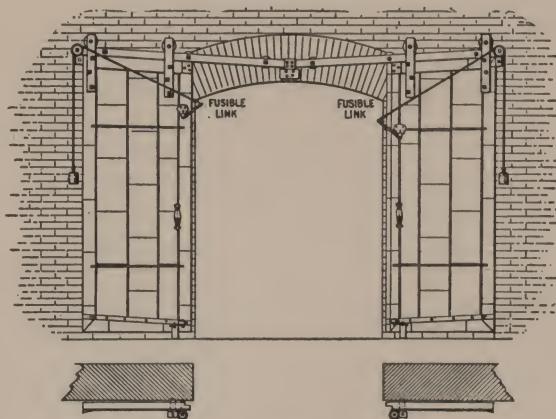


Fig. 25.

SLIDING DOORS IN PAIRS.
SHOWING RABBET IN CENTER JOINT.

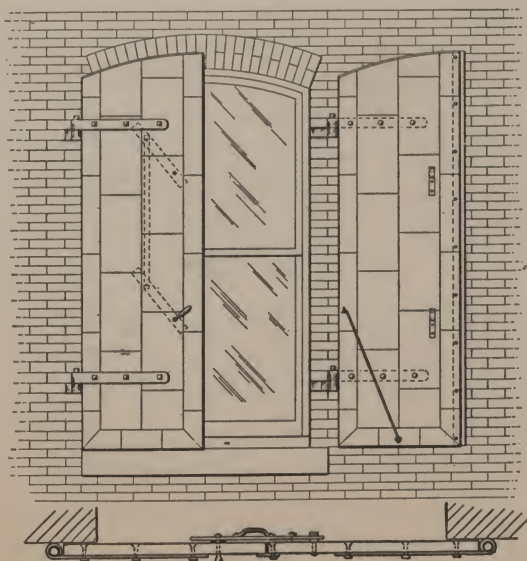


Fig. 26.

TIN-CLAD FIRE SHUTTERS.
SHOWING ASTRAGAL AT CENTER JOINT.

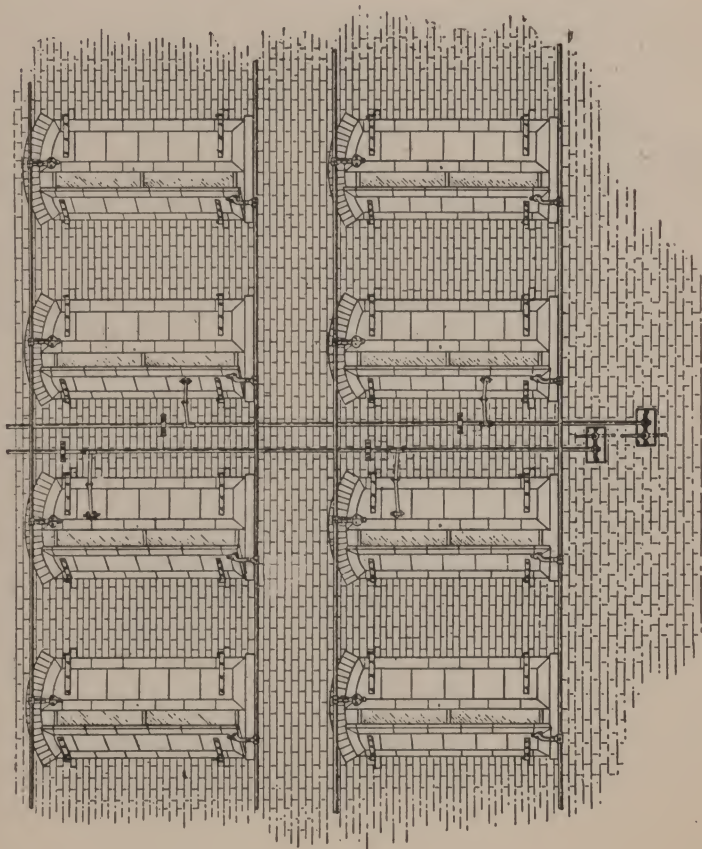


Fig. 27. GANG CONTROL FOR SHUTTERS.

INDEX

	Article	Page
Approval of doors and hardware.....		12
Astragal on swinging doors.....	8e	10
on shutters.....	12	11
Automatic releasing device.....	7k, 8f	8, 10
Binders for sliding doors.....	7i	7
Boards for wood core.....	5	3
Bolts for track.....	7a	5
for bumpers.....	7c	6
for hangers.....	7d	6
for chafing strips.....	7f	6
for handles.....	7h	7
for binders.....	7i	7
for stay roll.....	7j	7
for counterweight pulley.....	7k	8
for swinging door wall eyes.....	8a	9
for swinging door hinges.....	8b	9
for swinging door latch.....	8c	9
for swinging door keepers.....	8d	10
for shutter hinges.....	13	11
for shutter latches.....	14	11
Brackets for track.....	7b	5
Bumpers for sliding doors.....	7c	6
Bumper Shoes.....	7e	6
Care and maintenance of doors.....	9	10
Center joint for swinging and sliding doors.....	8e	10
for shutters.....	12	11
Chafing strips for sliding doors.....	7f	6
Clinch nails in wood core.....	5	3
Closing device for swinging doors.....	8f	10
Coating on tin plates.....	6a	4
Concrete sill.....	2	2
Construction of wood core.....	5	3
Cord for fusible link.....	7k	8
Core, two and three ply.....		1
construction of.....	5	3
Counterweight.....	7k	8
pulley.....	7k	8
Covering of door.....	6	4
Door frame, iron for swinging doors.....	4	3
Door openings.....	1	2
top of.....	3	3
Double lock joints.....		1
	6b	4

	Article	Page
Double swinging and sliding doors in pairs.....	8e	10
Dry rotting of wood core.....	5	3
		12
Elevator doors		1
Escape of gas from tin-clad door.....	6b	4
Exit doors.....	Introduction	
Expansion bolts.....	7a	5
Fusible link.....	7k	8
Gang control of shutters.....	14	11
Guarantee required.....		12
Guard for sliding doors.....	9	10
Handles for sliding doors.....	7h	7
for swinging doors.....	8c	9
Hangers.....	7d	6
Hanging of sliding doors.....	7a	5
Hardware for sliding doors.....	7	5
for swinging doors.....	8	9
for shutters.....	13 and 14	11
Head of door opening.....	3	3
Hinges for swinging doors.....	8b	9
for shutters.....	13	11
I-beam lintels for door openings.....	3	3
Incline of track.....	7a	5
Iron door sills.....	2	2
Joints in tin covering.....	6b	4
in swinging doors in pairs.....	8e	10
in shutters in pairs.....	12	11
Keepers for swinging door latch.....	8d	10
for shutter latch.....	14	11
Kiln drying of wood cores.....	5	3
Lap of doors.....	4a	3
of shutters.....	11	11
Latch for swinging doors.....	8c	9
for shutters.....	14	11
Link arm.....	7k	8
Link fusible.....	7k	8
	8f	10
Lintel for door opening.....	3	3
Lugs on hanger wheels.....	7d	6
Lumber for wood core.....	5	3

INDEX

25

	Article	Page
Malleable iron-hanger wheels.....	7d	6
handles.....	7h	7
stay roller.....	7j	8
counterweight sheave.....	7k	8
link arm.....	7k	8
Mitre fold in tin covering.....	6b	4
Mounting track for sliding doors.....	7a	5
Nailing of wood core.....	5	3
of tin covering.....	6b	4
Openings in wall.....	1	2
Operation of doors.....	9	10
Painting of fire doors.....	9	10
of shutters.....	15	11
of wood core opposite vent hole.....	6b	4
Pairs of doors, swinging and sliding.....	8e	10
of shutters.....	11 and 12	11
Patented doors.....	Introduction	
Pins for hinges, doors.....	8a	9
shutters.....	13	11
Pitch of top of door.....	4a	3
of track.....	7a	5
Rabbet in wall.....	4b	3
in center joint of doors.....	8e	10
in center joint of shutters.....	12	11
Releasing device.....	7k	8
	8f	10
Roller bearing for hanger wheels.....	7d	6
Roller guide for sliding doors.....	7j	7
Screws for bumper shoes.....	7e	6
for wedge.....	7g	7
for flush pull (handle).....	7h	7
for stay roll wearing strip.....	7j	7
for link arm.....	7k	8
Shutters.....		10
Sills.....	1b and 2	2
Size of door openings.....	1a	2
of doors.....	4a	3
Slatted guard for sliding doors.....	9	10
Sliding doors.....	Introduction	
	1	
	4a	3
Sliding doors in pairs.....	8e	10
Sliding door, hardware.....	7	5
releasing device.....	7k	8

	Article	Page
Sliding shutters	11	11
Special types of doors	Introduction	
Standard door		1
Stay roller, wearing strip for	7j	7
Stay roll guide	7j	7
Swinging doors, iron frame	4b	3
in pairs	8e	10
hardware	8	9
closing device	8f	10
Temperature rating of fusible link	7k	8
Terne plates	6a	4
Thickness of core	5	3
Three ply wood core, correct location for		1
construction of	5	3
Tin covering for doors	6	4
Track for sliding doors	7a	5
Top of door opening	3	3
Types of fire doors	Introduction	
		1
Two-ply wood core, correct location for		1
construction of	5	3
Vent hole in tin covering	6b	4
Wall eyes for swinging doors	8a	9
Washers for track bolts	7a	5
for binder bolts	7i	7
for latch bolts	8c	9
Wedge for sliding doors	7g	7
Weight for sliding doors	7k	8
Wood core, two and three ply		1
construction of	5	3
Wooden lintels for door openings	3	3



